

**Comments for Draft Revisions *(Not Applicable to Directives; Refer to Directive Management Officer for Directive Comment Format)***

[For detailed instructions on how to fill out the columns below, please see the Instructions sheet.](#)

<b>Comments Submitted By:</b>	Transport Airplane Directorate (POC:Jeff Meyers)
<b>Organization:</b>	ANM-111
<b>Phone:</b>	425-227-1275

#	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)	Disposition/Response to Comment
	20-138D	1	1-1.e	"This AC does not address new satellite constellations..."	New Appendix 8 now provides preliminary information for manufacturers to use when implementing new satellite constellations.	Change paragraph to "Appendix 8 provides preliminary information for manufacturers that wish to add new satellite constellations to their GNSS capability."	Conceptual	<b>Accepted.</b>
	20-138D	2	1-1.j	In lieu of following this method without deviation, the applicant may elect to follow alternate method, provided the alternate method is also found by the FAA to be acceptable means of complying with the requirements of the federal aviation regulations 14 CFR.	Add to the end of paragraph, clarification that FAA expects alternative means of compliance to be established through project specific issue paper.	Add to end of paragraph "This approval is typically achieved through a project specific issue paper".	Conceptual	<b>Accepted.</b>
	20-138D	16	3-4.b(2)	TSO-C115d requires RTCA/DO-283B...	Change first sentence to "TSO-C115d specifies that the FMS meet the minimum performance standard documentation and qualification requirements for Class A or Class B specified in sections 2.1 and 2.2 of RTCA/DO-283B."	See comment.	Editorial	<b>Accepted.</b>
	20-138D	16	3-4.b(2)	Highlighted text	The highlighted text provides information regarding required functions for Class A equipment, but does not provide a complete list of the required functions.	At the end of the highlighted text add "For a complete list of the required Class A functions, see RTCA/DO-283B, Table 2-13 and section 2.4.2.2."	Conceptual	<b>Partially Accepted.</b> Changed the sentence to read: <i>"See RTCA/DO-283B, Table 2-13 for a complete list of the required Class A and Class B functions."</i>

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	20-138D	17	3-4.c	First sentence	The first sentence is confusing since the FMS often does provide flight path deviation data during the final approach segment.	Change first sentence to "FMSs in typical federated avionics architectures do not need an incomplete TSO-C146d Class Delta-4 TSOA/LODA for LPV capability since the FMS (for a class Delta architecture) does not provide or process flight path deviation data	Conceptual	<b>Partially Accepted.</b> Changed the sentence to read: <i>"For Class Delta architectures, FMSs in typical federated..."</i>
	20-138D	33	5-3.3.b and others	200A	Replace all occurrences of DO-200A with latest standard DO-200B (which is soon to be recognized by AC 20-153B).	See comment.	Conceptual	<b>Accepted.</b>
	20-138D	49	6-6.b note 2	Highlighted text	Should add to advisory note that SC-159 is working on standards for GNSS aided inertial systems not meeting the performance requirements of part 121 appendix G.	Append to end of first sentence: "including GNSS aided inertial systems not meeting 14CFR part 121, appendix G."	Conceptual	<b>Accepted.</b>
	20-138D	53	7-1.e(1)	First sentence	Confusing requirement, needs rewording.	Change the first sentence to "GPS/SBAS and FMS equipment manufacturers should provide a statement in the RNP capabilities document for these additional RNP capabilities. Reference 12-7.b and appendix 5-2 for more information regarding the RNP capabilities document.	Conceptual	<b>Accepted.</b>



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	20-138D	86	11-1	Temperature compensation	Add a new paragraph (11-1.c) requiring that systems that have <b>not</b> incorporated temperature compensation be evaluated to ensure that there are procedures for manual altitude corrections, the effect on crew workload is manageable, and protections from erroneous altitude entries are established.	11-1.c Procedures for manual altitude corrections must be established for systems that do not provide automatic temperature compensation. The pilot workload of manually applying altitude corrections for all segments in the approach procedure (including the missed approach holding waypoint) must not be to burdensome. The system and/or procedures must incorporate protections from erroneous altitude entries.	Conceptual	Jeff to provide examples
	20-138D	96	12-8.a	"...but can also introduce complicating installation issue..."	Change "complicating" to "complicated".	See comment.	Conceptual	<b>Partially Accepted.</b> Changed "...also introduce complicating installation..." to "...also complicate installation..."
	20-138D	97	12-8.b	"tailored navigation database"	The use of the word "tailored" is not consistent with AC 20-153 definition of tailored data.	Delete the word "tailored".	Conceptual	<b>Accepted.</b>
	20-138D	98	12-8.d Note 2	Highlighted text	VNAV systems developed before 1989 may have been developed with consideration for misleading data to have at least major level effects.	Change 1st sentence in Note 2 to Baro-VNAV systems certified before 11/20/1989 may have been certified to a lesser standard not consistent with a major failure condition for misleading VNAV guidance.	Conceptual	<b>Accepted.</b>

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	20-138D	103	12-13	N/A	Add a new section to call out the requirements for runway position monitoring and alerting, reference DO-236C, Change 1, paragraph 3.4.2.2.	Add "12-13 Runway Position Monitoring: Unless implemented in another aircraft system, the positioning and navigation equipment must provide the capability to detect a discrepancy between the aircraft position/orientation and the runway entered in the system for departure. When the discrepancy is detected an alert must be annunciated to the flight crew (reference RTCA/DO-236C Change 1)."	Conceptual	<b>Partially Accepted.</b> New paragraph inserted as follows: "RTCA/DO-283B, implemented by TSO-C115d, has an option for including a runway position monitoring function in section 2.2.1.4.15. If this option has not been implemented within the FMS installed on transport category airplanes, the FAA recommends implementing the function on the airplane through another on-board system or combination of systems. The intent is to provide a function that detects a discrepancy between the aircraft position/orientation and the runway entered into the positioning/navigation system for departure. When the discrepancy is detected an alert must be annunciated to the flight crew."
	20-138D	132	17-2.a	Highlighted text, last sentence	Last sentence of this paragraph is not necessary and is not correct if it is talking about public instrument procedure development.	Delete the last sentence "Alternate levels of FTE may then be applied to instrument procedure development..."	Conceptual	<b>Partially Accepted.</b> Changed sentence to read: "The alternate FTE values may then be applied toward TSE in lieu of using the standard FTE values shown in Table 9." This change better expresses the point that applicants do not have to use the established FTE values from Table 9. It is possible to meet TSE by trading-off NSE and FTE.
	20-138D	142	20-4.d	Human factors	Add a new paragraph pointing to DO-283B human factor appendix.	20-4.d Additional human factor considerations are in RTCA/DO-283B, appendix F.	Conceptual	<b>Accepted.</b>
	20-138D	A2-3	A2-2.c	Equation	Square root sign appears twice.	Delete one of them.	Editorial	<b>Not Accepted.</b> Could not find a duplicate square root sign in the equation.

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#	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)	Disposition/Response to Comment
Comments Submitted By:			AIR-500					
Organization:			AIR-500					
Phone:			202-267-8590					
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	1	1-1 c.	RNAV intended for required navigation performance (RNP) operations, including advanced functions and RNP authorization required (AR) formerly referred to as special aircraft and aircrew authorization required (SAAAR).	There should be a comma after "(AR)".	For clarity, please insert a comma after (AR), as below:  "RNAV intended for required navigation performance (RNP) operations, including advanced functions and RNP authorization required (AR), formerly referred to as special aircraft and aircrew authorization required (SAAAR)."	Editorial	<b>OBE.</b> The phrase was removed and only the note remains describing how SAAAR changed to RNP AR.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	3	1-4.	The responses to these questions are intended to help applicants interpret the guidance contained in this AC.	For clarity and concision, replace "the" after "interpret" with "this" and strike "contained in this AC".	Consider replacing "the" after "interpret" with "this" and striking "contained in this AC", as below:  "The responses to these questions are intended to help applicants interpret <del>the this</del> guidance <del>contained in this AC</del> ."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	3 and UNIVERSAL	1-4. a. (2)	It is not the FAA's intent to burden installers by changing the GPWS or TAWS functions; impacting the GPWS or TAWS technical standard order authorization (TSOA); or, requiring that either GPWS or TAWS become the only means to provide the function.	The first two semicolons should be commas and the last comma should be deleted.	Please replace the semicolon after "functions" and the semicolon after "(TSOA)" with commas and delete the comma after the third occurrence of "or", as below:  "It is not the FAA's intent to burden installers by changing the GPWS or TAWS <b>functions</b> , impacting the GPWS or TAWS technical standard order authorization <b>(TSOA)</b> , <del>or,</del> requiring that either GPWS or TAWS become the only means to provide the function."  <b>There are many incorrect uses of semicolons. Please review uses of semicolons throughout the document. For information on semicolon usage, please see GPO Style Manual, sections 8.145.-8.147.</b>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	3 and UNIVERSAL	1-4. b. (2)	Doesn't RTCA/DO-229D assign a very specific meaning to the term 'VNAV' and dictate the term's specific uses for SBAS-based vertical navigation?	When referring to "VNAV", single quotation marks are used when double quotation marks should be used.	<p>Please replace single quotation marks surrounding "VNAV" with double quotation marks, as below:</p> <p>"Doesn't RTCA/DO-229D assign a very specific meaning to the term <b>"VNAV"</b> and dictate the term's specific uses for SBAS-based vertical navigation?"</p> <p>The use of single quotes occurs throughout the document. Please replace all similar uses of single quotation marks throughout the document. (e.g., GNSS, SBAS, C, B, b, etc.)</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	3 and UNIVERSAL	1-4. b. (2)	Refer to the following AC 20-138D, chapters for additional information:	This sentence is a little awkward and should be recast for clarity.	<p>Consider changing from the following:</p> <p>"Refer to the following AC 20-138D, chapters for additional information:"</p> <p>to the following:</p> <p><b>"For additional information, refer to the following chapters in AC 20-138D:"</b></p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	4 and UNIVERSAL	1-4. c.	Tightly-coupled inertial navigation system/global positioning system (INS/GPS).	The hyphen between "tightly" and "coupled" is unnecessary because the adverb "tightly" ends in "-ly".	Please remove the hyphen between "tightly" and "coupled", as below:  "Tightly coupled inertial navigation system/global positioning system (INS/GPS)."  Please correct all similar occurrences throughout the document (e.g. loosely-coupled, appropriately-scaled, etc.)	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	4	1-4. c. (2)	As stated in this AC, a GPS-based vertical approach capability requires GPS/SBAS or GPS/GBAS augmentation.	The phrase "As stated in this AC" is vague and could be confusing to the reader. Please refer to a specific paragraph or section.	Please reference a specific paragraph or section in this AC. For example—  "As stated in paragraph x-x this AC, a GPS-based vertical approach capability requires GPS/SBAS or GPS/GBAS augmentation."		<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	4 and UNIVERSAL	1-4. d. (2)	These performance limitations must be considered for the overall intended function at the aircraft level during the airworthiness approval (i.e., during the type certificate (TC), amended type certificate (ATC), or supplemental type certificate (STC) approval) to...	To avoid confusion, brackets are often used as a substitute for parentheses when the text is within another set of parentheses. Consider using brackets for acronyms or any other text when they are enclosed in parentheses.	Please consider placing "TC", "ATC", and "STC" in brackets, as below:  "These performance limitations must be considered for the overall intended function at the aircraft level during the airworthiness approval (i.e., during the type certificate [TC], amended type certificate [ATC], or supplemental type certificate [STC] approval) to..."  To ensure consistency, please change all similar occurrences throughout the document.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.



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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	5 and UNIVERSAL	1-4. e. (2)	The different names and acronyms used depend upon whether the topic is a generic, international reference to satellite navigation, or a particular State's specific implementation.	The comma after "satellite navigation" is unnecessary.	Please remove the comma after "satellite navigation", as below:  "The different names and acronyms used depend upon whether the topic is a generic, international reference to <b>satellite navigation</b> or a particular State's specific implementation."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	5 and UNIVERSAL	1-4. e. (2) (a)	The acronym 'GNSS' includes satellite constellations, such as GPS, GLONASS, Galileo, or Beidou, along with augmentation systems such as 'SBAS' and 'GBAS'; all of which provide a satellite-based positioning service.	This usage of a semicolon is incorrect. The semicolon should be replaced with a comma.	Please change the semicolon after "GBAS" to a comma, as below:  "The acronym GNSS includes satellite constellations, such as GPS, GLONASS, Galileo, or Beidou, along with augmentation systems such as 'SBAS' and <b>GBAS</b> , all of which provide a satellite-based positioning service."  <b>As mentioned in row 20, there are many similar semicolon misuses throughout the document; please review.</b>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	5 and UNIVERSAL	1-4. e. (2) (b)	Refer to Appendix 9 for definitions of terms and acronyms.	The word "Appendix" should be lowercase.	<p>Please change "Appendix" to lowercase, as below:</p> <p>"Refer to <b>appendix</b> 9 for definitions of terms and acronyms."</p> <p>Some other words that should not be capitalized unless they occur at the beginning of a sentence are—figure, table, chapter, section, etc.</p> <p>Please correct all similar occurrences throughout the document.</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	5 and UNIVERSAL	1-4. e. (2) (b)	For example, during an RNAV-1 operation the TSE remains within one nautical mile of the desired path 95% of the time (see Figure 1 below).	Because this sentence refers to figure 1 specifically, the word below is unnecessary and should be omitted.	<p>Please strike the word "below" after "figure 1", as below:</p> <p>"For example, during an RNAV-1 operation the TSE remains within one nautical mile of the desired path 95% of the time (see figure 1 <b>below</b>)."</p> <p>Please correct any similar occurrences throughout the document.</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	5	1-4. f. (2)	RNP is an RNAV subset that also includes a requirement to provide on-board navigation system accuracy performance monitoring and alerting which means an RNP system is also an RNAV system.	There should be a comma inserted after "alerting".	<p>Please insert a comma after "alerting", as below:</p> <p>"RNP is an RNAV subset that also includes a requirement to provide on-board navigation system accuracy performance monitoring and <b>alerting</b>, which means an RNP system is also an RNAV system."</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	5	1-4. f. (2)	GNSS equipment provides accuracy performance monitoring and alerting which, by definition, makes it both an RNAV and RNP capable system.	There should be a hyphen inserted after "RNAV" and "RNP" because they join together with "capable" to modify "system".	Please insert a hyphen after "RNAV" and "RNP", as below:  "GNSS equipment provides accuracy performance monitoring and alerting which, by definition, makes it both an <b>RNAV-</b> and <b>RNP-</b> capable system."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	6	1-4. f. (2) (c)	None of the preceding statements should be confused with RNP AR that requires special aircraft and aircrew approval.	Is RNP AR singular or plural? If it is singular, leave as is. If it is plural, change to "require".	If "RNP AR" is singular, leave as is. If it is plural, change to "require", as below:  "None of the preceding statements should be confused with RNP AR that <b>require</b> special aircraft and aircrew approval."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	6 and UNIVERSAL	1-4. f. (2) (c)	No RNP AR procedures can be included in the navigation databases of equipment that is not approved for RNP AR operations.	The use of "can" in the last sentence in this section seems incorrect. If the sentence refers to permission granted then "can" should be changed to "may". If the sentence refers to ability or capacity then leave as is.	If the sentence refers to permission granted, please replace "can" with "may", as below. If not, leave as is.  "No RNP AR procedures <b>may</b> be included in the navigation databases of equipment that is not approved for RNP AR operations."  <b>RULE:</b> "Can" signifies ability or capacity. "May" requests or grants permission. In negative expressions, "can" is acceptable for "may."  Example: When you can [not may] get here on time, you may [not can] be excused early. However, if you are not on time, you cannot [or may not] expect privileges.  Please ensure proper usage of "can" and "may" throughout the document and make changes where appropriate.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	7	1-4. g. (2)	<p>The basis for a TSOA is that the applicant has sufficient control over the design and production to assure the system meets the minimum performance standard published by the FAA.</p>	<p>While these words are often used interchangeably, “ensure” is a better word for this application. Please replace “assure” with “ensure” as per the following rule:</p> <p>Assure – to tell someone something positively or confidently to dispel doubt or anxiety. It is to promise or pledge to someone so as to remove doubt or anxiety.</p> <p>Ensure – to make certain that some outcome shall occur or be the case. It is something you do to guarantee or confirm an event, condition, or outcome.</p>	<p>Please replace "assure" with "ensure" as below:</p> <p>"The basis for a TSOA is that the applicant has sufficient control over the design and production to <b>ensure</b> the system meets the minimum performance standard published by the FAA."</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	8 and UNIVERSAL	1-4. g. (2)	<p>However, we do allow for incomplete systems to obtain an authorization, as explained in the latest revision of AC 21-46, Technical Standard Order Program.</p>	<p>For clarity and concision, replace "as explained in" with "see" and putting the phrase "see the latest revision of AC 21-46, <i>Technical Standard Order Program</i>" in parentheses.</p>	<p>Consider replacing "as explained in" with "see" and putting the phrase "see the latest revision of AC 21-46, Technical Standard Order Program" in parentheses, as below:</p> <p>"However, we do allow for incomplete systems to obtain an authorization <b>as-explained-in (see the latest revision of AC 21-46, <i>Technical Standard Order Program</i> ).</b>"</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	8	1-4. h. (1)	Is it acceptable for equipment manufacturers to include approach procedure step-down fixes in the navigation database; particularly when LPV capability is included?	The semicolon after "database" should be replaced with a comma.	Please replace the semicolon after "database" with a comma, as below:  "Is it acceptable for equipment manufacturers to include approach procedure step-down fixes in the navigation <b>database</b> , particularly when LPV capability is included?"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	8	1-4. i.	Using RTCA Inc. document (RTCA)/(DO)-178C Software Considerations in Airborne Systems and Equipment Certification, dated December 13, 2011.	There should be a comma separating "(RTCA)/(DO)-178C" with its title.	Please insert a comma after "(RTCA)/(DO)-178C", as below:  "Using RTCA Inc. document <b>(RTCA)/(DO)-178C</b> , <i>Software Considerations in Airborne Systems and Equipment Certification</i> , dated December 13, 2011."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	10	2-1.	The regulations and TSOs can be found at: <a href="http://rgl.faa.gov">http://rgl.faa.gov</a> .	The colon after "be found at" is unnecessary.	Please strike the colon after "be found at", as below:  "The regulations and TSOs can <b>be found at</b> <a href="http://rgl.faa.gov">http://rgl.faa.gov</a> ."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	10	2-2. a.	It is beneficial to involve the ACO (both engineers and flight test pilots) in equipment evaluations as early as possible for four primary reasons:	Adding "the following" after "as possible for" would make this sentence clearer for the reader.	For clarity, consider inserting "the following" after "as possible for", as below:  "It is beneficial to involve the ACO (both engineers and flight test pilots) in equipment evaluations as early as possible for <b>the following</b> four primary reasons:"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	10	2-2. a. (3)	There is no one, single standard for interfacing positioning and navigation equipment to other equipment on-board the aircraft such as displays, autopilots, and terrain warning systems.	The word "one" is redundant and could be omitted.	Consider deleting "one," after "There is no", as below:  "There is no <del>one</del> , single standard for interfacing positioning and navigation equipment to other equipment on-board the aircraft such as displays, autopilots, and terrain warning systems."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	10 and UNIVERSAL	2-2. a. (4)	The installed intended function for the equipment needs to be compatible with the original design for the system, including software and hardware design assurance levels and data process assurance levels.	"Needs to" should be replaced with "must".	Please replace "needs to", as below, <b>here and for similar occurrences throughout the document.</b>  "The installed intended function for the equipment <del>needs to must</del> be compatible with the original design for the system..."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	10 and UNIVERSAL	2-2. a. (4)	For example: a decision by the positioning and navigation equipment manufacturer to develop system software to RTCA/DO-178B Level C, may limit installation...	The colon after "For example" should be replaced by a comma.	Please replace the colon after "For example" with a comma, as below:  " <b>For example</b> , a decision by the positioning and navigation equipment manufacturer to develop system software to RTCA/DO-178B Level C, may limit installation ..."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	10 and UNIVERSAL	2-2. a. (4), Note	AC 20-115C provides guidance on using RTCA/DO-178C including re-using software qualified to previous RTCA/DO-178 revisions.	There should be a comma after "RTCA/DO-178C".	Please insert a comma after "RTCA/DO-178C", as below:  "AC 20-115C provides guidance on using <b>RTCA/DO-178C</b> , including re-using software qualified to previous RTCA/DO-178 revisions."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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<b>Phone:</b>			425-227-1275					
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	10 and UNIVERSAL	2-2. b., Note	It is not this paragraph's intent to limit positioning and navigation installation STCs solely to avionics manufacturers.	The phrase "this paragraph's intent" seems awkward because it sounds like the paragraph can think for itself. Who's intent is this sentence really referring to?	Please consider recasting this sentence. I'm not exactly sure how to put it, but something to the effect of the following:  "It is not <b>the FAA's</b> intent to limit positioning and navigation installation STCs solely to avionics manufacturers."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	11	2-3. b.	The installer needs access to the STC approved data; apply the approved data; and comply with the detailed installation instructions.	"STC approved" should be hyphenated because it modifies "data". Both semicolons are unnecessary. It seems like sentence would be clearer if "and must" was added after "STC-approved data".	Please add a hyphen to "STC approved", delete the semicolon after both occurrences of "data" and add "and must" after "STC-approved data", as below:  "The installer needs access to the <b>STC-approved</b> data; <b>and must</b> apply the approved data; and comply with the detailed installation instructions."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	12	3-1. b.	TSO-C196(AR) defines GPS sensor equipment that incorporates many processing improvements found in the GPS/SBAS equipment MOPS; but, without the GPS/SBAS requirements.	The semicolon after "MOPS" should be replaced with a comma and the comma after "but" should be deleted.	Please replace the semicolon after "MOPS" and  "TSO-C196(AR) defines GPS sensor equipment that incorporates many processing improvements found in the GPS/SBAS equipment <b>MOPS</b> , <b>but without</b> the GPS/SBAS requirements."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.



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<b>Phone:</b>			425-227-1275					
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	12	3-1. b.	Two improvement examples are: a requirement for the receiver to properly account for satellite range error if it is reflected in the User Range Accuracy index (commonly referred to as being "Selective Availability aware"), and requirements to ensure performance is not degraded due to an increasing radio frequency noise environment as other satellite systems become available.	The comma after "aware') is unnecessary.	Please delete the comma after "aware')", as below:  "...User Range Accuracy index (commonly referred to as being "Selective Availability <b>aware</b> ") <b>and</b> requirements to ensure performance is not degraded..."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	13	3-1. b. (4)	In particular, applicants will need to show compliance to all RTCA/DO-316 requirements not addressed in RTCA/DO-229C, and requirements that are more stringent such as enroute/terminal mode accuracy and the broadband external interference noise environment.	"Will need to" should be replaced with "must". For clarity and ease of reading, "and" after "RTCA/DO-229C" should be replaced with "as well as". Also, there should be a comma after "stringent".	Please consider replacing "will need to" with "must" and "and" after "RTCA/DO-229C" with "as well as". Also, insert a comma after "stringent", as below:  "In particular, applicants <del>will need to</del> <b>must</b> show compliance to all RTCA/DO-316 requirements not addressed in RTCA/DO-229C, <b>and as well as</b> requirements that are more <b>stringent</b> , such as enroute/terminal mode accuracy and the broadband external interference noise environment."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	13 and UNIVERSAL	3-2 a.	TSO-C145d, Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Satellite-Based Augmentation System (SBAS) and TSO-C146d, Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Satellite Based Augmentation System (SBAS) define an acceptable standard for GPS/SBAS equipment.	There should be a comma inserted after "SBAS)" at the end of the first reference title. Also, there should be a comma after "SBAS)" at the end of the second reference title.	"TSO-C145d, Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Satellite-Based Augmentation System (SBAS), and TSO-C146d, Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Satellite Based Augmentation System (SBAS), define an acceptable standard for GPS/SBAS equipment."  Please correct all similar occurrences throughout the document.  Example of correct format— XX-XXX, Reference Title,...	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	14 and UNIVERSAL	3-2 d.	The difference between revisions 'b' and 'c' to the GPS/SBAS TSOs is eliminating a 3 decibel (dB) broadband intra-system noise credit for operational Class 1 and Class 2 equipment in RTCA/DO-229D.	This sentence would be clearer if "eliminating" was replaced with "the elimination of". Also, there should be a hyphen between "3" and "decibel".  <b>RULE:</b> Compound adjectives  When two or more words are combined to form a compound adjective, a hyphen is usually required. This rule does not apply when first word ends in "-ly" (as mentioned in row 23 above).	Please consider replacing "eliminating" with "the elimination of". Also, insert a hyphen between "3" and "decibel", as below:  "The difference between revisions 'b' and 'c' to the GPS/SBAS TSOs is <del>eliminating</del> the elimination of a 3-decibel (dB) broadband intra-system noise credit for operational Class 1 and Class 2 equipment in RTCA/DO-229D."  Please correct all occurrences of compound adjectives with missing hyphens throughout the document.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	14	3-2 e.	The difference between revisions 'c' and 'd' to the GPS/SBAS TSOs is: recognizing TSO-C204/C205 circuit card assemblies; and using Change 1 to RTCA/DO-229D.	As with the example in row 50, this sentence would be clearer if "recognizing" was replaced with "the recognition of" and "using" was replaced with 'the use of". Also, the semicolon after "assemblies" is unnecessary.	Please consider replacing "recognizing" with "the recognition of" and "using" with 'the use of". Please strike the semicolon after "assemblies" and replace the single quotation marks around "c" and "d" with double quotation marks (as was mentioned in row 21). See example below.  "The difference between revisions "c" and "d" to the GPS/SBAS TSOs is: <del>recognizing</del> the recognition of TSO-C204/C205 circuit card assemblies; and <del>using</del> the use of Change 1 to RTCA/DO-229D."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	15 and UNIVERSAL	3-3. c.	A partial missed approach capability is an option in the GPS/GBAS equipment but is not required (see note).	The reference "see note" should be more specific. Perhaps add "in the following paragraph" after "see note".	<p>To make reference specific, consider adding something like "in the following paragraph" after "see note", as below:</p> <p>"A partial missed approach capability is an option in the GPS/GBAS equipment but is not required (see note <b>in the following paragraph</b>)."</p> <p><b>There are many other instances of non-specific references throughout the document. Please ensure that all internal (within this AC) references are specific.</b></p> <p><b>Another example—</b></p> <p>"The current TSOs for passive and active antennas are listed <b>in paragraphs (2) and (3) in this section (5-2.1 a) below</b>, but antennas previously certified to TSO-C144 are also acceptable (see table 2)."</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	15	3-4.	There is no plan to withdraw TSO authorizations granted under earlier TSO-C115-revisions.	The hyphen between "TSO-C115" and "revisions" is unnecessary.	<p>Please delete the hyphen between "TSO-C115" and "revisions", as below:</p> <p>"There is no plan to withdraw TSO authorizations granted under earlier <b>TSO-C115 revisions</b>."</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	15	3-4.	Manufacturers of earlier TSO-C115 revisions can continue production according to their TSOA/LODA; and the equipment is still eligible for installation in accordance with the guidance in this AC.	For clarity, accuracy and ease of reading, "can" should be changed to "may" and the "and" after "TSOA/LODA;" should be deleted.	Consider changing "can" to "may" and deleting the "and" after "TSOA/LODA;," as below:  "Manufacturers of earlier TSO-C115 revisions <del>can</del> <b>may</b> continue production according to their TSOA/LODA; <del>and</del> the equipment is still eligible for installation in accordance with the guidance in this AC."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	17 and UNIVERSAL	1-1.i.	The applicant will be required to obtain a navigation database for their respective navigation system that contains the test procedures.	There is a disagreement between singular noun ("applicant") and plural possessive noun ("their"). "Their" should be replaced with "his or her".	Please correct the disagreement between "applicant" and "their" by replacing "their" with "his or her", as below:  "The applicant will be required to obtain a navigation database for <del>their</del> <b>his or her</b> respective navigation system that contains the test procedures."  <b>Please correct all similar occurrences throughout the document.</b>	Editorial	<b>Not Accepted.</b> Unable to find where the comment applies.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	17 and 119	3-4. b. (3) and 15-7.2	Class Gamma-1 can be used for FMSs that don't intend to process GPS/SBAS vertical deviations.	<p>The contraction "don't" is informal and should be spelled out.</p> <p>On page 119, the contraction "hasn't" is used. It should also be spelled out.</p>	<p>Please spell out "don't", as below:</p> <p>"Class Gamma-1 can be used for FMSs that <b>do not</b> intend to process GPS/SBAS vertical deviations."</p> <p>There is a similar example on page 119. The word "hasn't" is used in section 15-7.2. Please change to "<b>has not</b>".</p> <p>There is another example on page A9-1. The word "hasn't" is used in section A9-1.i. Please change to "<b>has not</b>".</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev			For example; unambiguous navigation source and approach service level annunciation, discontinuities or jumps when switching from baro-VNAV to GPS/SBAS vertical guidance, and prioritizing when to use which source (see paragraphs 6-3.b, 16-2.a, and 18-5).	The semicolon after "For example" should be replaced with a comma.	<p>Please replace the semicolon after "For example" with a comma, as below:</p> <p>"For <b>example</b>, unambiguous navigation source and approach service level annunciation, discontinuities, or jumps when switching from baro-VNAV to GPS/SBAS vertical guidance, and prioritizing when to use which source (see paragraphs 6-3.b, 16-2.a, and 18-5)."</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	19	3-5. b.	However, TSO-C204 can be used for the sensor portion of a Class Gamma unit similar to using TSO-C204 in an FMS or multi-mode receiver.	This sentence would be clearer if it was broken up into two sentences.	Please consider breaking this sentence up into two sentences. Also, please replace "can" with "may", as below  "However, TSO-C204 <del>can</del> <b>may</b> be used for the sensor portion of a Class Gamma <b>unit</b> . <b>This is</b> similar to using TSO-C204 in an FMS or multi-mode receiver."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	19	3-5 d.	<ul style="list-style-type: none"> <li>• compliance with the requisite MOPS section 2 requirements,</li> <li>• hardware/software development,</li> <li>• failure condition classification, and;</li> <li>• partial MOPS performance testing.</li> </ul>	The words "compliance", "hardware", "failure", and "partial" should be capitalized for consistency of formatting. Also, the comma after "classification" should be replaced with a semicolon and replace the semicolon after "and" with a comma.	Please capitalize "compliance", "hardware", "failure", and "partial". Also, in the third bullet item, please replace the semicolon after "and" with a comma and the comma before "and" with a semicolon, as below:  "• <b>Compliance</b> with the requisite MOPS section 2 requirements, • <b>Hardware</b> /software development, • <b>Failure</b> condition <b>classification</b> ; and, • <b>Partial</b> MOPS performance testing."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	19	3-5 e.	To receive a GNSS sensor TSOA the end-use equipment manufacturer data submittal is:	Should this sentence end with "is" or "are"? It refers to end-use equipment manufacturer data sub	"To receive a GNSS sensor TSOA the end-use equipment manufacturer data submittal <b>are—</b> "	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	21	4-1, Note 1	Advisory vertical guidance is an optional capability implemented at the equipment manufacturer's discretion for enroute, terminal, and/or approach operations; not a requirement for positioning and navigation equipment.	This sentence would be easier to read and understand if it was split into two sentences between "operations;" and "not a requirement".	Consider splitting this into two sentences by replacing the semicolon after "operations" with a period and beginning the second sentence with "It is", as below:  "Advisory vertical guidance is an optional capability implemented at the equipment manufacturer's discretion for enroute, terminal, and/or approach <b>operations</b> . It is not a requirement for positioning and navigation equipment."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	24	4-2.e.(2)	GPS/SBAS equipment manufacturers should exercise care when implementing "advisory" vertical guidance for LNAV minima coincident with LNAV/VNAV and display capability can influence the ability to provide an unambiguous, easily distinguishable vertical guidance indication during the airworthiness approval.	This sentence is confusing. It seems like maybe it is supposed to be broken into two sentences.	Please review and clarify. One possible edit is to insert a period after "LNAV" and start the second sentence with "Minima", as below:  "GPS/SBAS equipment manufacturers should exercise care when implementing "advisory" vertical guidance for <b>LNAV</b> . <b>Minima</b> coincident with LNAV/VNAV and display capability can influence the ability to provide an unambiguous, easily distinguishable vertical guidance indication during the airworthiness approval."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.



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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	26	5-1.a.	Chapters 7 - 10 provide more information about RNP.	The hyphen between 7 and 10 should be replaced with "through".	Please consider replacing the hyphen between 7 and 10 with "through", as below:  "Chapters 7 <b>through</b> 10 provide more information about RNP."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	27 and UNIVERSAL	5-2.a.	TSO-C129(AR) and TSO-C196(AR) GPS equipment may be used on RNAV 'T' and 'Q' routes and for RNAV approaches to LNAV minimums within the contiguous U.S..	There should only be one period at the end of this sentence.	Please delete the second extra period at the end of the sentence, as below:  "TSO-C129(AR) and TSO-C196(AR) GPS equipment may be used on RNAV 'T' and 'Q' routes and for RNAV approaches to LNAV minimums within the contiguous U.S.."  <b>Please correct any similar occurrences throughout the document.</b>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	27	5-2.b.	See enroute charts, Notices to Airman Publication (NTAP), and Notice to Airmen (NOTAMs) for latest equipment requirements in Alaska.	The acronym use in this sentence is a little awkward. Consider the changes in the next cell (unless it is standard FAA usage).	Unless acronym use is standard FAA usage, please consider making the following changes:  "See enroute charts, Notices to Airman Publications (NTAPs), and Notices to Airmen (NOTAMs) for latest equipment requirements in Alaska."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	29	5-2.2.d.	TSO-C196(AR) equipment is intended as a direct replacement for Class B & C sensors certified to TSO-C129(AR). Additionally, TSO-C145(AR) equipment can also replace TSO-C129(AR) Class B & C sensors.	The ampersands should be replaced with "and" in both sentences.	Please consider replacing the ampersands in both sentences with "and", as below:  "TSO-C196(AR) equipment is intended as a direct replacement for Class B <b>&amp; and</b> C sensors certified to TSO-C129(AR). Additionally, TSO-C145(AR) equipment can also replace TSO-C129(AR) Class B <b>&amp; and</b> C sensors."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	29	5-2.3.a.	Flight Standards defines the operational requirements to review NOTAMs, review published aeronautical information, and perform pre-departure receiver autonomous integrity monitoring (RAIM) or FDE availability checks.	For clarity and ease of reading, the second occurrence of "review" and the comma preceding it should be deleted and replaced with "and", and the comma following "information" should be deleted.	Please consider deleting the second occurrence of "review" and the comma preceding it and replacing them with "and" and deleting the comma following "information", as below:  "Flight Standards defines the operational requirements to review NOTAMs, <b>review and</b> published aeronautical information, and perform pre-departure receiver autonomous integrity monitoring (RAIM) or FDE availability checks."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	29	5-2.3.b.	The guidelines also apply to prediction programs for TSO-C145/C146(AR) if the equipment is intended for oceanic/remote operations without limitations (see appendix 1 and paragraph 5-3.2.a.	The second parenthesis and period are missing from the end of the sentence.	Please insert a close parenthesis and period after "5-3.2.a.", as below:  "The guidelines also apply to prediction programs for TSO-C145/C146(AR) if the equipment is intended for oceanic/remote operations without limitations (see appendix 1 and paragraph 5-3.2.a.)."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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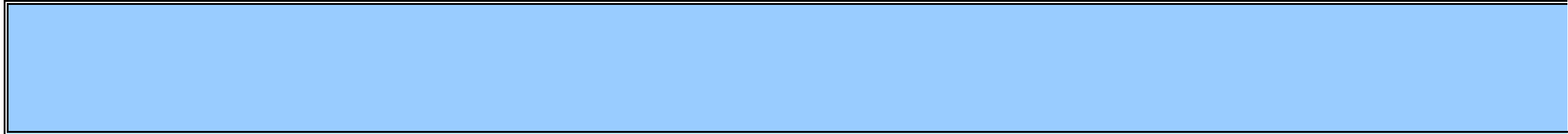
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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	32	5-3.2.b.	AC 90-100 (latest revision), contains specific information on performance requirements for RNAV routes.	The comma after "(latest revision)" is unnecessary and should be deleted.	Please delete the comma after "(latest revision)", as below:  "AC 90-100 (latest revision), <del>,</del> contains specific information on performance requirements for RNAV routes."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	32 and UNIVERSAL	5-3.2.b.	Equipment manufacturers need to ensure a zero in the glide path angle field does not cause unintended software issues; for example, a divide by zero problem.	"Need to" should be replaced with "must", the semicolon after "software issues" should be replaced with a colon, and "divide by zero" should be hyphenated.	Please replace "need to" with "must", replace the semicolon after "software issues" with a colon, and hyphenate "divide by zero", as below:  "Equipment manufacturers <del>need to</del> <b>must</b> ensure a zero in the glide path angle field does not cause unintended software issues: for example, a divide-by-zero problem."  "Need to" is used throughout the document where "must" would be a better word choice. Please review all uses of "need to" and replace with "must" where appropriate.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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<b>Comments Submitted By:</b>			Transport Airplane Directorate (POC:Jeff Meyers)					
<b>Organization:</b>			ANM-111					
<b>Phone:</b>			425-227-1275					
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	38	5-5.4.f, table 2	"TSO-C145/C146 revision 'b' or later Opn'l Class 1" and "TSO-C145/C146 revision 'b' or later Opn'l Class 2, 3, 4 "	The titles of the sixth and seventh columns in table 2 require the following edits:  -Replace single quotes around "b" with double quotes -Capitalize "later" -Spell out "Opn'l" as "Optional"	Please consider the following edits to the sixth and seventh column titles:  -Replace single quotes around "b" with double quotes -Capitalize "later" -Spell out "Opn'l" as "Optional"  "TSO-C145/C146 revision "b" or Later Optional Class 1"  and  "TSO-C145/C146 Revision "b" or Later Optional Class 2, 3, 4 "	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	41	6-3.d.	Many RNAV multi-sensor systems have implemented baro-VNAV for use in all phases of flight, and baro-VNAV can be used for vertical guidance on an LNAV/VNAV approach procedure.	I think this should be broken up into two sentences by ending the first sentence after "flight".	Consider breaking this up into two sentences, as follows:  "Many RNAV multi-sensor systems have implemented baro-VNAV for use in all phases of flight. Baro-VNAV can be used for vertical guidance on an LNAV/VNAV approach procedure."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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Organization:		ANM-111						
Phone:		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	42 and UNIVERSAL	6-4.b.	The FAA cannot ensure all DME signals within reception distance of U.S. airspace meet ICAO standards. These could include non-U.S. DME facilities, or Department of Defense (DOD) maintained DME facilities excluded from the NAS database...Although a procedure design issue, applicants may mitigate this restriction by:	For clarity, "that" should be inserted after "ensure" in the first sentence. In the second sentence, there should be a hyphen inserted after "Defense" and "DOD" so that a compound adjective is formed with "maintained". The final sentence would be clearer if "it is" were inserted after "Although". Also, the colon at the end of the final sentence should be replaced with an em dash.	Please consider the changes below:  "The FAA cannot ensure <b>that</b> all DME signals within reception distance of U.S. airspace meet ICAO standards. These could include non-U.S. DME facilities, or Department of <b>Defense-</b> ( <b>DOD-</b> ) maintained DME facilities excluded from the NAS database...Although <b>it is</b> a procedure design issue, applicants may mitigate this restriction <b>by—</b> "  <b>RULE:</b> When a complete sentence introduces a list—an independent clause—use a colon. When introducing a list with a dependent clause, use an em dash.  <b>Throughout the document, please change all occurrences where incorrect punctuation introduces a list.</b>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	43	Table 3	12,000 ft above facility elevation 18,000 ft above facility elevation	The abbreviation "ft" is used here with no period at the end. There are other occurrences throughout the document where periods are used. There should not be a period and the usage should be consistent.	Please ensure consistency when using the abbreviation "ft" throughout the document.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.



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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	46	6-4.2. (2), (3), and (4)	"(2) TSO-C66a: (Sep 1965)" "(3) TSO-C66b: (Nov 1978)" "(4) TSO-C66c: (Sept 1985)"		Please maintain consistency with abbreviations of months. Also, please end each abbreviation with a period, as below:  "(2) TSO-C66a: (Sept. 1965)" "(3) TSO-C66b: (Nov. 1978)" "(4) TSO-C66c: (Sept. 1985)"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	48 and UNIVERSAL	Table 4.2D	Numbers in column 0	The numbers in column 0 should be aligned like those in the other columns.	Please ensure that the decimal points in column 0 are aligned.  Please ensure that decimal points are aligned vertically in all table columns throughout the document.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	59	8-3.g.	The RNP system must have the following navigation displays and functions installed in accordance with this AC. Navigation data, including a TO/FROM indication and a failure indicator, must be displayed on a lateral deviation display (course deviation indicator (CDI), electronic horizontal situation indicator (EHSI)) and/or a navigation map display.	The first sentence is a little confusing. To what does "the following navigation displays" refer? Also,		Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	62	8-4.	The original equipment manufacturer (OEM) or the holder of installation approval for the aircraft (e.g., STC holder), must demonstrate compliance with the appropriate provisions of this AC to the FAA and the approval can be documented in manufacturer documentation (e.g., Service Letters, etc.).	This sentence is confusing. It would be clearer if a comma was inserted after "(OEM)" and "that" was inserted after "FAA and".	Consider adding a comma after "(OEM)" and inserting "that" after "FAA and", as below:  "The original equipment manufacturer (OEM), or the holder of installation approval for the aircraft (e.g., STC holder), must demonstrate compliance with the appropriate provisions of this AC to the FAA and <b>that</b> the approval can be documented in manufacturer documentation (e.g., Service Letters, etc.)."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	65	9-3.a.(3) and (5)	(5) Table 9 in chapter 17 indicates allowable "FTE credit" for various RNP operations when using autopilot, flight director, or manual flight control. Applicants may use these FTE values toward meeting TSE for the desired RNP operation without further demonstration or evaluation. Note: Using a lateral deviation indicator with 2 NM full-scale deflection is an acceptable means of compliance for maintaining TSE. An autopilot or FD may also be used for maintaining TSE, but roll stabilization systems do not qualify.	Section 9-3.a.(5) (including the note) should be deleted because it is a repetition of 9-3.a.(3).	Please delete section 9-3.a.(5) (including the note).	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	69	9-5.1	Section 9.5 provides guidance on the performance and functional criteria for rotorcraft enroute RNP 0.3 and the installed GPS/SBAS equipment, at a minimum, must meet the criteria for RNP 2.0, RNP 1.0 and RNP APCH to LNAV minima.	This sentence is confusing. It seems like there should be a "which" added after "equipment".	If it makes sense, consider adding "which," after "equipment," as below:  "Section 9.5 provides guidance on the performance and functional criteria for rotorcraft enroute RNP 0.3 and the installed GPS/SBAS equipment, <b>which</b> , at a minimum, must meet the criteria for RNP 2.0, RNP 1.0 and RNP APCH to LNAV minima."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	71	9-5.2.g (1) and (2)	(1) The rotorcraft enroute RNP 0.3 system must have the following navigation displays and functions installed in accordance with this AC.  (2) Navigation data, including a TO/FROM indication and a failure indicator, must be displayed on a lateral deviation display (course deviation indicator (CDI), electronic horizontal situation indicator (EHSI)) and/or a navigation map display. These must be used as primary flight instruments for aircraft navigation, for maneuver anticipation, and for failure/status/integrity indication.	Because 9-5.2.g (1) refers to "the following navigation displays", this section would be clearer if 9-5.2.g (2) was moved to before 9-5.2.g (1) (which would change it9-5.2.g [1] into 9-5.2.g [2] and vice-versa).	Consider switching the order of 9-5.2.g (1) and 9-5.2.g (2), as below. (If the order is switched, insert a colon after "AC" at the end of [2].)  "(1) Navigation data, including a TO/FROM indication and a failure indicator, must be displayed on a lateral deviation display (course deviation indicator (CDI), electronic horizontal situation indicator (EHSI)) and/or a navigation map display. These must be used as primary flight instruments for aircraft navigation, for maneuver anticipation, and for failure/status/integrity indication.  (2) The rotorcraft enroute RNP 0.3 system must have the following navigation displays and functions installed in accordance with this <b>AC</b> :"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.



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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	75	10-2.1.b	Malfunction of the aircraft's long-range navigation equipment without annunciation is a major failure condition (i.e., the probability of a malfunction with no annunciation must be less than 10-5 per hour).	In some sections throughout the document, the word "major," when used to describe a failure condition, is capitalized and not capitalized in others. Capitalization of "major" should be consistent (when it is used in this manner).	Please ensure consistency of capitalization in all occurrences of "major" (when it is used to refer to a failure condition).  "Malfunction of the aircraft's long-range navigation equipment without annunciation is a <b>major</b> failure condition (i.e., the probability of a malfunction with no annunciation must be less than 10-5 per hour)."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	78	10-2.2.d.(1)(a)	The flight crew must base any adjustments to the time limit on the demonstrated capability of the updates stated in the aircraft's airworthiness approval documentation (i.e. the AFMS(S)).	There should be a comma after "i.e." and the "S" in "AFMS(S)" should be in brackets (because it is within parenthesis).	Please insert a comma after "i.e." and change the parentheses used to enclose "S" to brackets, as below:  "The flight crew must base any adjustments to the time limit on the demonstrated capability of the updates stated in the aircraft's airworthiness approval documentation ( <b>i.e.</b> , the AFMS <b>[S]</b> )."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	78 and UNIVERSAL	10-2.2.d.(1)(b)	Refer to 14 CFR § 121.351, § 125.203, and § 135.165.	"14 CFR" should be removed from this sentence, as should section symbols before "125.203" an "135.165". Also, the section symbol before "121.351" should be replaced with double section symbols.  (Per Order 1320.460, <i>FAA Advisory Circular System</i> , section 10, <i>Using References in the Text of an AC</i> , subsection i)	Delete the section symbols before "125.203" an "135.165" and replace the section symbol before 121.351 with double section symbols, as below:  "Refer to §§ 121.351, 125.203, and 135.165."  <i>Please review Order 1320.460, FAA Advisory Circular System, section 10, Using References in the Text of an AC, subsection i and correct all 14 CFR references that are improperly formatted throughout the document.</i>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision. This comment in particular is inconsistent with the comments received during legal review.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	79	10-2.2.e.(3)	An airworthiness applicant or existing airworthiness approval holder requests an extended time limit by showing how multiple navigation sensors that mix or average navigation position error justifies an extension (e.g., triple-mixed INSs).	Because it refers to "multiple navigation sensors that mix or average navigation position error", "justifies" should be "justify".	Please replace "justifies" with "justify", as below:  "An airworthiness applicant or existing airworthiness approval holder requests an extended time limit by showing how multiple navigation sensors that mix or average navigation position error <i>justify</i> an extension (e.g., triple-mixed INSs)."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	79	10-2.3.b.	The following example AFM(S) wording (or equivalent) is used when RNP 10 is granted for a change in, or new demonstration of, the INS/IRU certified performance:	This sentence would be clearer if the word "of" was inserted between "example" and "AFM(S)".	Please insert "of" between "example" and "AFM(S)", as below:  "The following example <b>of</b> AFM(S) wording (or equivalent) is used when RNP 10 is granted for a change in, or new demonstration of, the INS/IRU certified performance:"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	81	10-3.1.f.(2)	These must be used as primary flight instruments for aircraft navigation, for maneuver anticipation, and for failure/status/integrity indication. A non-numeric lateral deviation display (for example, CDI, EHSI), with a TO/FROM indication and a failure annunciation, used as primary flight instruments for aircraft navigation, for maneuver anticipation, and for failure/status/integrity indication, should have the following attributes:	The word "for" is repeated several times unnecessarily in these two sentences. They should be removed for clarity and ease of reading.	Please remove occurrences of the word "for", as below:  "These must be used as primary flight instruments for aircraft navigation, <b>for</b> maneuver anticipation, and <b>for</b> failure/status/integrity indication. A non-numeric lateral deviation display (for example, CDI, EHSI), with a TO/FROM indication and a failure annunciation, used as primary flight instruments for aircraft navigation, <b>for</b> maneuver anticipation, and <b>for</b> failure/status/integrity indication, should have the following attributes:"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	84	103.1.g.(13)(d)	The system must annunciation prior to the end of the offset path, with sufficient time to return to the original path.	Is the word "annunciation" being used correctly here?	Please review this sentence and ensure that "annunciation" is being used correctly. If it is, then it is ok as is. If it is not, please correct.  "The system must annunciation prior to the end of the offset path, with sufficient time to return to the original path."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	93	12-2.a., table 8	GNSS Precision Approach (Cat. I)	In the title of the sixth column, "Cat." should be spelled out as "Category".	Please spell out "Cat." as below:  "GNSS Precision Approach ( <b>Category</b> I)"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	95	12-5.	There is no one, single, standardized interface for positioning and navigation equipment to other equipment on-board the aircraft such as displays, autopilots, terrain warning, etc.	The word "single" in this sentence is redundant and should be deleted.	Please delete "single," as below:  "There is no one, <del>single,</del> standardized interface for positioning and navigation equipment to other equipment on-board the aircraft such as displays, autopilots, terrain warning, etc."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	95	12-5.	But the installation burden is greatly eased when equipment manufacturers define compatible systems in their installation manual/instructions, including software version and/or part number if necessary.	For clarity and ease of reading, "version" and "number" should be plural.	Please make "version" and "number" plural, as below:  "But the installation burden is greatly eased when equipment manufacturers define compatible systems in their installation manual/instructions, including software <b>versions</b> and/or part <b>numbers</b> if necessary."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	96	12-8.a.	But, some previously published RNAV (GPS) approach procedures still contain unnamed final approach segment step-down fixes, meaning there will be a mix of named and unnamed step-down fixes published with RNAV (GPS) approach procedures until all the procedures receive their periodic update.	The comma after "But" should be deleted and "update" at the end of the sentence should be plural.	Please delete the comma after "but" and pluralize "update", as below:  "But, some previously published RNAV (GPS) approach procedures still contain unnamed final approach segment step-down fixes, meaning there will be a mix of named and unnamed step-down fixes published with RNAV (GPS) approach procedures until all the procedures receive their periodic <b>updates.</b> "	Editorial	<b>Accepted.</b>
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	97	12-8.c.	The airworthiness applicant must ensure the displayed RNAV(GPS) approach is in the primary field of view, in the proper sequence, unambiguous, and without creating detrimental clutter.	This sentence would be clearer and easier to read if "without creating" was replaced with "does not create".	Please consider replacing "without creating" with "does not create", as below:  "The airworthiness applicant must ensure the displayed RNAV(GPS) approach is in the primary field of view, in the proper sequence, unambiguous, and <b>without creating does not create</b> detrimental clutter."	Editorial	<b>Accepted.</b>
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	99	12-9.b.	Example:  82° north latitude and 82°	The word "degree(s)" and the degree symbol "°" seem to be used interchangeably throughout the document. There should be consistency of usage.	Please ensure correct usage and consistency of "degree(s)" and degree symbol "°".	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	101	12-11.b.(1), note 3	Additional guidance can be found in FAA Human Factors Design Guide. DOT/FAA/CT-96/1.	The reference to DOT/FAA/CT-96/1 would be clearer if the period after "Guide" was replaced with a comma.	Please consider replacing the period after "Guide" with a comma, as below:  "Additional guidance can be found in FAA Human Factors Design <b>Guide</b> , DOT/FAA/CT-96/1."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	116	15-4.a.	The aircraft-level effect from losing GNSS positioning, velocity, and timing is a complex problem that depends on the GNSS equipment design, the degree of integration with other systems, and where the installations take place.	For clarity, "the location" should be inserted after "systems, and".	Consider inserting "the locations after "systems, and", as below:  "The aircraft-level effect from losing GNSS positioning, velocity, and timing is a complex problem that depends on the GNSS equipment design, the degree of integration with other systems, and <b>the location</b> where the installations take place."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	121	15-7.8.a.	Aircraft with ILS capability that is interfaced to GPWS or Class A TAWS (Mode 5 GPWS) alert for ILS deviations below the ILS glideslope must also include a glideslope alerting function during a GPS/SBAS LPV approach.	"Aircraft" should have "an" before it because it is being used in the singular form.	Please consider inserting "an" at the beginning, as below:  " <b>An aircraft</b> with ILS capability that is interfaced to GPWS or Class A TAWS (Mode 5 GPWS) alert for ILS deviations below the ILS glideslope must also include a glideslope alerting function during a GPS/SBAS LPV approach."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	123	15-9.1.b.	For installations where the GPS/GBAS sensor is integrated with other landing systems, such as an MMR, the "ILS look-alike" implies that the MMR signal to the autopilot is scaled in terms of depth of modulation (DDM) units, with sensitivity as described in RTCA/DO-253C, paragraph 2.3.11.5.1.1.1 and paragraph 2.3.11.5.1.2.1.	This sentence would be more concise if "paragraph" after "RTCA/DO-253C" was plural and the second occurrence of "paragraph" was deleted.	Please consider making "paragraph" after "RTCA/DO-253C" plural and deleting the second occurrence of "paragraph", as below:  "For installations where the GPS/GBAS sensor is integrated with other landing systems, such as an MMR, the "ILS look-alike" implies that the MMR signal to the autopilot is scaled in terms of depth of modulation (DDM) units, with sensitivity as described in RTCA/DO-253C, <del>paragraphs</del> 2.3.11.5.1.1.1 and <del>paragraph</del> 2.3.11.5.1.2.1."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	129	16-2.1.b.	Non-numeric deviation displays (for example, a CDI or (E)HSI) with a TO/FROM indication and a failure annunciation should have the following attributes:	There should be a close parenthesis after "annunciation".	Please insert a close parenthesis after "annunciation", as below:  "Non-numeric deviation displays (for example, a CDI or (E)HSI) with a TO/FROM indication and a failure <del>annunciation</del> ) should have the following attributes:"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	129	16-2.2.	Map displays should give equivalent functionality to a non-numeric lateral deviation display described above, and be readily visible to the pilot with appropriate map scales (scaling may be set manually by the pilot.)	This sentence probably should be broken up into two sentences, ending after "scales".	Please consider breaking this sentence into two by inserting a period after "scales" and an open parenthesis before "scaling". "Scaling" should be capitalized. Also, the comma after above should be deleted, as below:  "Map displays should give equivalent functionality to a non-numeric lateral deviation display described above, and be readily visible to the pilot with appropriate map <b>scales</b> . ( <b>Scaling</b> may be set manually by the pilot.)"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	132	17-1.	RNP AR installation considerations are in appendix 2 of this AC and Advanced RNP Function installation considerations are in appendix 3.	For clarity, the word "located" should be inserted before "in appendix 2" and before "in appendix 3". Also, "of this AC" should be moved to the end of the sentence.	Please consider inserting "located" before "in appendix 2" and before "in appendix 3". Also, move "of this AC" to the end of the sentence, as below:  "RNP AR installation considerations are <b>located</b> in appendix 2 and Advanced RNP Function installation considerations are <b>located</b> in appendix 3 of this AC ."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.



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<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	132	17-2.a.	FTE assessments for approach or missed approach, or other defined operations, may be made by an aircraft manufacturer, an avionics manufacturer, or an operator to establish alternate levels of expected FTE to be used for navigation system or procedure authorization.	The word "an" is repeated unnecessarily in this sentence.	Please delete the "an" before "avionics" and the "an" before "operator", as below:  "FTE assessments for approach or missed approach, or other defined operations, may be made by an aircraft manufacturer, <del>an</del> avionics manufacturer, or <del>an</del> operator to establish alternate levels of expected FTE to be used for navigation system or procedure authorization."	Editorial	<b>Accepted.</b>
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	133	17-2.b.	The assessment should key to types of procedures to be flown, appropriately consider normal, non-normal and rare normal operations, should address pilot capability or system variability to the extent necessary, and should have sufficient repeatability to have confidence in the FTE level(s) that result.	This sentence is confusing and should be broken up into two sentences.	Please consider breaking up this sentence by inserting a period after "normal operations" and capitalizing "It". Also, for clarity, please change "consider" to "considering" in the first sentence and deleting "should" after "and" in the second sentence, as below:  "The assessment should key to types of procedures to be flown, appropriately <b>considering</b> normal, non-normal, and rare normal operations. <b>It</b> should <b>also</b> address pilot capability or system variability, to the extent necessary, and <del>should</del> have sufficient repeatability to have confidence in the FTE level(s) that result."	Editorial	<b>Accepted.</b>

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Comments Submitted By:		Transport Airplane Directorate (POC:Jeff Meyers)						
Organization:		ANM-111						
Phone:		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	134	18-2.b.	A Baro-VNAV airworthiness approval must have language in the installation instructions for an AFM(S)/RFM(S) limitation on baro-VNAV vertical path guidance.	"Baro-VNAV" should not be capitalized at the beginning of this sentence.	Please change "Baro-VNAV to "baro-VNAV", as below:  "A <b>baro-VNAV</b> airworthiness approval must have language in the installation instructions for an AFM(S)/RFM(S) limitation on baro-VNAV vertical path guidance."	Editorial	<b>Accepted.</b>
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	137 and UNIVERSAL	18-6.	For aircraft with ILS capability that is interfaced to GPWS or Class A TAWS (Mode 5 GPWS) alert, the FAA....	This sentence is confusing. Is "aircraft" singular or plural?	Please review both versions of the sentence below and choose the correct version. In the first "aircraft" is singular and in the second it is plural.  "For <b>an</b> aircraft with ILS capability that is interfaced to <b>a</b> GPWS or Class A TAWS (Mode 5 GPWS) alert, the FAA...."  "For aircraft with ILS capability that <b>is are</b> interfaced to GPWS or Class A TAWS (Mode 5 GPWS) <b>alerts</b> , the FAA...."  <b>The word "aircraft" is used both in singular and plural forms throughout the document. Please review and make any corrections related to incorrect usage.</b>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	139	19-4.c.	A data flow diagram can be a useful aid in depicting all the interfaces.	This sentence would be clearer if the word "of" was inserted between "all" and "the".	Please consider inserting "of" between "all" and "the", as below:  "A data flow diagram can be a useful aid in depicting all <b>of</b> the interfaces."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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<b>Organization:</b>		ANM-111						
<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	139	19-4.d.	For example, some autopilots depend upon a radio altimeter, or, middle marker beacon passage inputs to enable a "glideslope extension" function to reduce "porpoising" or aerodynamic instability when coupled to a glideslope signal during the final approach phase.	The commas after "altimeter" and after "or" are unnecessary and could confuse the reader.	For clarity, please delete the comma after "altimeter" and after "or", as below:  "For example, some autopilots depend upon a radio altimeter, or, middle marker beacon passage inputs to enable a "glideslope extension" function to reduce "porpoising" or aerodynamic instability when coupled to a glideslope signal during the final approach phase."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	140	19-8.	An AFMS/RFMS must be provided that contains the limitations and operating procedures applicable to the installed equipment configuration.	This sentence would be clearer and easier to read if "must be provided" was moved to after "configuration" at the end of the sentence.	Please consider moving "must be provided" to after "configuration" at the end of the sentence, as below:  "An AFMS/RFMS <del>must be provided</del> that contains the limitations and operating procedures applicable to the installed equipment configuration <b>must be provided.</b> "	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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Organization:		ANM-111						
Phone:		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	143	21-1.b. and 21-1.c.	b. Evaluate the following VHF frequencies (25 kHz channels):  121.150 MHz 121.175 MHz 121.200 MHz 131.250 MHz 131.275 MHz 131.300 MHz  c. For VHF radios with 8.33 kHz channel spacing, evaluate the following additional VHF frequencies:  121.185 MHz 121.190 MHz 130.285 MHz 131.290 MHz	The format of the VHF frequencies in sections 21-1.b. and 21-1.c. could be confusing to readers. You might consider putting them into bulleted lists.	For clarity, please consider putting VHF frequencies in bulleted lists in the format below:  "b. Evaluate the following VHF frequencies (25 kHz channels):  -121.150 MHz, -121.175 MHz, -121.200 MHz, -131.250 MHz, -131.275 MHz, -131.300 MHz."  c. For VHF radios with 8.33 kHz channel spacing, evaluate the following additional VHF frequencies:  -121.185 MHz, -121.190 MHz, -130.285 MHz, -131.290 MHz."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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Organization:		ANM-111						
Phone:		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	144 and UNIVERSAL	21-2.1.b.	b. Verify the overall GNSS equipment operation to include at least the following:  (1) Hold at a designated waypoint; (2) Intercept and track to or from a waypoint on a selected course; (3) Turn anticipation; (4) Waypoint sequencing; (5) Selection of an approach; (6) The general presentation of navigational data (depiction of the "TO" waypoint, distance to waypoint, estimated time of arrival, estimated time enroute, ground speed, etc.); and (7) Evaluate the overall operation on all types of procedures or paths that the equipment supports (e.g., straight legs, DME arcs, and RF legs).	The lead-in sentence for paragraph b is awkward and could be confusing to the readers. Also, the items in this list should follow the same format (begin with a verb).  Check all lists in the document to ensure that all items within each list follow the same format as the others in the list.	Consider inserting a comma after "operation" and Also, change line items 4, 5, and 6 so that they begin with a verb, as below:  b. Verify the overall GNSS equipment <b>operation</b> , to include at least the following:  (1) Hold at a designated waypoint; (2) Intercept and track to or from a waypoint on a selected course; (3) Turn anticipation; (4) <b>Sequence</b> Waypoint <b>sequencing</b> ; (5) <b>Selection-of-Select</b> an approach; (6) <b>The-general-presentation-of-Present</b> navigational data (depiction of the "TO" waypoint, distance to waypoint, estimated time of arrival, estimated time enroute, ground speed, etc.); and (7) Evaluate the overall ).	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
						operation on all types of procedures or paths that the equipment supports (e.g., straight legs, DME arcs, and RF legs		

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<b>Organization:</b>		ANM-111						
<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	145	21-2.1.e.	The following issues should be evaluated when the equipment is interfaced with a FGS.	I think this paragraph would be easier to understand if the first sentence was moved after the last sentence so that it becomes the list lead-in sentence.	Please consider moving the first sentence to after the last sentence and ending it with a colon instead of a period, as below:  "The following issues should be evaluated when the equipment is interfaced with a <b>FGS</b> :"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	145	21-2.2.b.	For installations where the autopilot has been modified, the autopilot lateral/vertical control channel performance has not been assessed, or non-standard deviations are provided (not ILS-like), then the approach performance will need to be evaluated per the latest revision....	For clarity, "then" after "(not ILS-like)," should be deleted. Also, "will need to" should be replaced with "must".	Please consider deleting "then" after "(not ILS-like)," and replacing "will need to" with "must", as below:  "For installations where the autopilot has been modified, the autopilot lateral/vertical control channel performance has not been assessed, or non-standard deviations are provided (not ILS-like), <del>then</del> the approach performance <del>will need to</del> <b>must</b> be evaluated per the latest revision ...."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A1-1	A1-1.	GPS Oceanic/Remote Navigation.	"GPS Oceanic/Remote Navigation" is the same as the title of appendix 1.	Please change the title of section A1-1 so that it is not the same as the title of appendix 1.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev and UNIVERSAL	A1-2	A1-2.b(4)	... navigation equipment with a mean time between failures of at least 1000 hours each (for dual equipage).	There should be a comma after the 1 in 1000. Per GPO Style Manual, section 8.48., a comma should be used "to separate thousands and millions in numerical figures.	"...navigation equipment with a mean time between failures of at least 1,000 hours each (for dual equipage)."  Please review all numbers over 999 throughout the document and insert commas where appropriate.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A1-3	A1-3.b(2)(b)	However, any method used should properly take into account satellite movement and aircraft dynamics up to a groundspeed of 750 knots (kts) and accelerations up to 14.7 meters/second/second (1.5 g's).	Is "meters/second/second" after 14.7 correct?	Please review the sentence below. If "meters/second/second" is incorrect, please correct. If it is correct, leave as is.  "However, any method used should properly take into account satellite movement and aircraft dynamics up to a groundspeed of 750 knots (kts) and accelerations up to 14.7 meters/second/second (1.5 g's)."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-1 and UNIVERSAL	A2-1.b.	The AFM/RFM or other aircraft qualification evidence should address: the required modes of operation to fly an RNP AR approach; the normal and abnormal flight crew operating procedures; responses to failure alerts and annunciations; and any other operating limitations.	Though colons are used to introduce lists, in this sentence, the colon after "address" is unnecessary and should be deleted. Also, the semicolons used in the sentence should all be replaced by commas.	<p>Please remove the colon after "address" and replace all semicolons in the sentence with commas, as below:</p> <p>"The AFM/RFM or other aircraft qualification evidence should address: the required modes of operation to fly an RNP AR approach, the normal and abnormal flight crew operating procedures, responses to failure alerts and annunciations, and any other operating limitations."</p> <p>This usage of the colon occurs in many other places throughout the document. Please remove colons from sentences where they are not necessary.</p> <p>Similarly, this usage of the semicolon occurs in many other places throughout the document. Please replace semicolons with commas in sentences where they are used incorrectly.</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-5	A2-3.b(1)(a)	...GPS sensor accuracy better than 36 meters (95%), and augmented GPS/SBAS sensor accuracy is better than 2 meters (95%).	The word "is" after "accuracy" seems out of place and should be deleted.	<p>Please consider deleting "is" after "accuracy", as below:</p> <p>"...GPS sensor accuracy better than 36 meters (95%), and augmented GPS/SBAS sensor accuracy <del>is</del> better than 2 meters (95%)."</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.



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<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-5	A2-3.b(1)(a)	Sensors processing other GNSS' may also be able to provide similar or better accuracies without further substantiation. This guidance can be updated once countries with other GNSS' provide an assured statement of operational system accuracy.	Both occurrences of "GNSS" in this section seem to be plural. The apostrophe is incorrect and should be replaced with an "s".	Please delete the apostrophe after both occurrences of "GNSS" and add an "s" to the end of each one, as below:  "Sensors processing other <b>GNSSs</b> may also be able to provide similar or better accuracies without further substantiation. This guidance can be updated once countries with other <b>GNSSs</b> provide an assured statement of operational system accuracy."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-14	A2-3.d(14)	The aircraft must display barometric altitude from two independent altimetry sources, one in each pilots' primary optimum field of view to support an operational cross check of altitude sources.	Because "pilots" is preceded by "each" it is singular so the apostrophe should be placed between the "t" and "s" in "pilots".	Please move the apostrophe to between the "t" and "s" in "pilots", as below:  "The aircraft must display barometric altitude from two independent altimetry sources, one in each <b>pilot's</b> primary optimum field of view to support an operational cross check of altitude sources."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-17	A2-5.	A2-5. Requirements for RNP AR Approach values less than 0.3.	"Requirements for RNP AR Approach values less than 0.3." is a title and should be in title case; therefore, "values", "less", and "than" should be capitalized.	Please capitalize "values", "less", and "than", as below:  "A2-5. Requirements for RNP AR Approach <b>Values Less Than</b> 0.3."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-20	A2-6.c., figure 3	Text in figure 3	"Min." should be spelled out as "Minimum" in both instances in the figure. "LTP" has not been previously defined in the text. (The first occurrence is on page 97. It should be defined there.)	Please spell out "Min." as "Minimum". And ensure that "LTP" has been defined on page 97.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-24	A2-8.b.	Verify annunciation of RNP failure modes exists.	This sentence would be clearer if "that" was inserted after "Verify".	Please consider inserting "that" after "Verify", as below:  "Verify <b>that</b> annunciation of RNP failure modes exists."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-24	A2-8.b.	Verify that following failure modes, any pilot selected entries are retained or their cancellations annunciated (e.g., manual entry of RNP type, blackballed navaid, etc.).	"Pilot selected" should be hyphenated. Also, unless it is an FAA convention, "NAVAID" should be in all caps.	Please hyphenate "pilot selected". Also, unless it is an FAA convention, please change "navaid" to all caps, as below:  "Verify that following failure modes, any <b>pilot-selected</b> entries are retained or their cancellations annunciated (e.g., manual entry of RNP type, blackballed <b>NAVAID</b> , etc.)."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A2-24	A2-8.c.	Avionics manufacturers should note the following guidance to ensure their positioning and navigation equipment can support RNP operations.	This sentence is written as a lead-in sentence which introduces a list; therefore, it should end with a colon.	Please replace the period at the end of this sentence with a colon, as below:  "Avionics manufacturers should note the following guidance to ensure their positioning and navigation equipment can support RNP <b>operations</b> :"	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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Organization:		ANM-111						
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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A3-1	A2-8.c.iv., note	ICAO document 9613 Performance Based Navigation (PBN) Manual, fourth edition, 2013 lists six advanced RNP functions. The six functions are: • RF legs • Parallel offsets • Scalable RNP • RNAV holding • Fixed radius transitions (FRT) • Time of arrival control (TOAC)	Because it is a title, "Performance Based Navigation (PBN) Manual" should be in italics. Also, the list items should end with commas, with the exception of the last one, which should end with a period.	Please change "Performance Based Navigation (PBN) Manual" to italics. Also, please end each list item with a comma, with the exception of the last list item, which should be ended with a period, as below:  "ICAO document 9613 <i>Performance Based Navigation (PBN) Manual</i> , fourth edition, 2013 lists six advanced RNP functions. The six functions are: • RF <i>legs</i> , • Parallel <i>offsets</i> , • Scalable <i>RNP</i> , • RNAV <i>holding</i> , • Fixed radius transitions ( <i>FRT</i> ), • Time of arrival control ( <i>TOAC</i> )."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A3-3 and UNIVERSAL	A3-2.a.(3)	System documentation should support maintenance of FTE (95 percent of the flying time) during straight and curved path segments, for each phase of flight and each autopilot and/or FD mode requested.	Though the usage of the word "percent" is correct in this sentence. The use of the word percent vs. the percent symbol (%) throughout the document should be reviewed.	<p>This use of the word "percent" is correct:</p> <p>"System documentation should support maintenance of FTE (95 percent of the flying time) during straight and curved path segments, for each phase of flight and each autopilot and/or FD mode requested."</p> <p>The word "percent" and the percent symbol (%) seem to be used interchangeably throughout the document. Please review usage keeping in mind GPO Style Manual section 10.5: "Following a figure, the spelled form is preferred. The percent symbol is used in areas where space will not allow the word <i>percent</i> to be used."</p>	Editorial	<b>Accepted.</b> Per the comment, no change is necessary to this paragraph.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A4-4 and UNIVERSAL	A4-3.g	The formula in section g.	Throughout the document, many of the formulas are not printed clearly. In many cases the letters and symbols overlap.	Please review all formulas in the document and ensure that they are written clearly and accurately.	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A4-5	A4-6.e, note 1	The components of the jerk in the north and east direction depends on the heading chosen in the scenario.	The word "depends" refers to "components"; therefore, it should be "depend".	<p>Please strike the "s" at the end of "depends", as below:</p> <p>"The components of the jerk in the north and east direction <b>depend</b> on the heading chosen in the scenario."</p>	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A4-9	A4-11.	The following procedure is one acceptable means for equipment to demonstrate...	It is unclear to which procedure this sentence refers.	Please clarify to which procedure this sentence refers:  "The following procedure is one acceptable means for equipment to demonstrate..."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A4-11	A4-12.b.	GNSS manufacturers may choose to not have their equipment provide a ground track output acceptable for the ADS-B true track angle/true track validity parameter.	The phrase "to not have" sounds informal and should be changed to "not to have".	Please consider changing the phrase "to not have" to "not to have", as below:  "GNSS manufacturers may choose <b>not to have</b> their equipment provide a ground track output acceptable for the ADS-B true track angle/true track validity parameter."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A4-12	A4-12.c.(4)	Use the GNSS noise environment defined in the velocity test (paragraphs A4-3 through A4-8), or for sensors not originally certified to the latest noise environment standards, use a reduced environmental noise level as described in paragraphs A4-2.d(3) and A4-2d.(4).	The comma after "A4-8)" is misplaced. It should be inserted after "or".	Please move the comma after "A4-8)" to after "or", as below:  "Use the GNSS noise environment defined in the velocity test (paragraphs A4-3 through A4-8); <b>or</b> , for sensors not originally certified to the latest noise environment standards, use a reduced environmental noise level as described in paragraphs A4-2.d(3) and A4-2d.(4)."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A5-9	A5-2	"Section II Operating Limitations" and "MODEL XXX"	"Section II Operating Limitations" and "MODEL XXX" are in a different font than the rest of the section. Is this correct?	If the different font is intentional, leave as is. If it is not, please correct.	Editorial	<b>Accepted.</b>

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	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A5-9	A5-2, Navigation Operational Capabilities table	Table text	In the second row of the second column (Operational Requirements/Authorizations), the spacing of the word "availability" is too tight. Also, the text in the third row under the same column is cut off. The text is also cut off in the second row of the third column (Required Equipment).	Please ensure that the spacing of all occurrences of the word "availability" in this table is correct. Also, please ensure that no text is cut off in this table (including pages A5-10 and A5-11).	Editorial	<b>Not Accepted.</b> Unable to find where the comment applies. This must be a screen display anomaly because there are no spacing issues or text cut-off as described.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A5-10	A5-2, Navigation Operational Capabilities table (cont.)	EPU/ANP does not exceed RNP.	In the first, second, and third rows under the second column (Operational Requirements/Authorizations), the acronym "RNP" is on the next line because of a carriage return. The carriage return should be replaced with a space.	Please replace carriage return after "exceed" with a space, as below: "EPU/ANP does not exceed RNP."	Editorial	<b>Accepted.</b>
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A5-11	A5-2, Navigation Operational Capabilities table (cont.)	RNP AR-APCH procedures, and approach procedures with RF legs are NOT authorized.	In the first row under the first column (Navigation Specification), the comma after "AR-APCH procedures" is unnecessary and should be deleted.	Please delete the comma after "AR-APCH procedures", as below: "RNP AR-APCH procedures, and approach procedures with RF legs are NOT authorized."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A5-11	A5-2, Navigation Operational Capabilities table (cont.)	Meets the applicable requirements of, AC20-138D, AC90-105, EASA AMC 20-27.	In the first row under the third column (Reference Guidance), the comma after "of" is unnecessary and should be deleted. Also, the carriage return after "AC90-105" should be replaced with a space.	Please delete the comma after "of" and replace the carriage return after "AC90-105" with a space, as below: "Meets the applicable requirements of, AC20-138D, AC90-105, EASA AMC 20-27."	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.

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Comments Submitted By:			Transport Airplane Directorate (POC:Jeff Meyers)					
Organization:			ANM-111					
Phone:			425-227-1275					
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A7-9	PFAF table	Table text	The following acronyms should be defined in this table:  PFAF LAT LON TCH GPI	Please define the following acronyms in the PFAF table:  PFAF LAT LON TCH GPI	Editorial	<b>Not Accepted.</b> TThe previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision. These tables are technical data intended for applicants with the technical knowledge to construct approach charts. The data are presented in the form expected by the intended user.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A7-10	Leg Table 1 and Leg Table 2	Table text	The following abbreviations and acronyms should be defined in these tables:  Min Obs. Max Spd Dir Grad Alt FB HM NMI Arc	Please define the following abbreviations and acronyms in the Leg Table 1 and Leg Table2 table:  Min Obs. Max Spd Dir Grad Alt FB HM NMI Arc	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision. These tables are technical data intended for applicants with the technical knowledge to construct approach charts. The data are presented in the form expected by the intended user.

[For detailed instructions on how to fill out the columns below, please see the Instructions sheet.](#)

<b>Comments Submitted By:</b>		Transport Airplane Directorate (POC:Jeff Meyers)						
<b>Organization:</b>		ANM-111						
<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A7-10	Waypoint Data table	Table text	The following abbreviation should be defined in these tables:  Deg	Please define the following abbreviation in the Waypoint Data table:  Deg	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision. These tables are technical data intended for applicants with the technical knowledge to construct approach charts. The data are presented in the form expected by the intended user.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A8-1	A8-1.a.	Standards development to support aviation use of non-U.S. core constellations is in work by RTCA SC-159 in accordance with their approved terms of reference.	The phrase "is in work by" is a little confusing.	Please clarify this sentence by replacing the phrase "is in work by" with one that more easily explains what the writer is trying to say. For example, something such as the following:  "Standards development to support aviation use of non-U.S. core constellations is <b>included in</b> work by RTCA SC-159 in accordance with their approved terms of reference."	Editorial	<b>Partially Accepted.</b> The sentence is changed as follows: <i>"RTCA SC-159 is developing standards to support aviation use of non-U.S. core constellations in accordance with their approved terms of reference."</i>
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A8-1	A8-1.b.	No FAA TSO exists for GLONASS, GPS/GLONASS, nor DFMC avionics.	Use of the word "nor" is incorrect.	Please replace the word "nor" with "or", as below:  "No FAA TSO exists for GLONASS, GPS/GLONASS, <del>nor</del> <b>or</b> DFMC avionics."	Editorial	<b>Accepted.</b>



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<b>Comments Submitted By:</b>		Transport Airplane Directorate (POC:Jeff Meyers)						
<b>Organization:</b>		ANM-111						
<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A8-1	A8-1.c.	Manufacturers that include non-U.S. constellation capability must ensure that capability is integrated on a non-interference basis and that any non-U.S. constellation's failures, errors, or alerts do not affect GPS, GPS/SBAS, or GPS/GBAS capability.	For ease of reading, the second occurrence of "capability" should be replaced by "it".	Please consider replacing "capability" after "that" with "it", as below:  "Manufacturers that include non-U.S. constellation capability must ensure that <del>capability</del> it is integrated on a non-interference basis and that any non-U.S. constellation's failures, errors, or alerts do not affect GPS, GPS/SBAS, or GPS/GBAS capability."	Editorial	<b>Accepted.</b>
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A10-1 through A10-6	A10-1.a. through A10-1.tt., A10-2.a. through A10-2.r., and A10-3.a. through A10-3.t.	AC 20-107B, <i>Composite Aircraft Structure</i> , and all other reference titles in this section	Reference titles should not end with periods.	Please remove periods from all of the reference titles in this section. See example below:  "AC 20-107B, <i>Composite Aircraft Structure</i> "	Editorial	<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A10-3	A10-1.uu	uu. AC 120-33, Operational Approval of Airborne Long-Range Navigation Systems for Flight within the North Atlantic Minimum Navigation Performance Specification Airspace.	Because section "tt" above section "uu" has been deleted, section "uu" should be renamed "tt".	Please replace "uu." with "tt." as below:  <del>uu</del> tt. AC 120-33, <i>Operational Approval of Airborne Long-Range Navigation Systems for Flight within the North Atlantic Minimum Navigation Performance Specification Airspace</i> .	Editorial	<b>OBE.</b> The numbering will be done automatically <u>once the deletion is actually performed</u> . The whole point of showing the strike-out is to make it easy for those reviewing the document to see what is changing.

[For detailed instructions on how to fill out the columns below, please see the Instructions sheet.](#)

<b>Comments Submitted By:</b>		Transport Airplane Directorate (POC:Jeff Meyers)						
<b>Organization:</b>		ANM-111						
<b>Phone:</b>		425-227-1275						
	AC20-138D Chg 2_ Rev 3 (2) Field Rev	A10-6	A10-5.c	You can find copies of ACs on the FAA website at <a href="http://www.faa.gov/regulations_policies/advisory_circulars/">http://www.faa.gov/regulations_policies/advisory_circulars/</a> , or <a href="http://www.airweb.faa.gov/rgl">www.airweb.faa.gov/rgl</a> .	The comma after " <a href="http://www.faa.gov/regulations_policies/advisory_circulars/">http://www.faa.gov/regulations_policies/advisory_circulars/</a> " is unnecessary and should be removed.	Please delete the comma after " <a href="http://www.faa.gov/regulations_policies/advisory_circulars/">http://www.faa.gov/regulations_policies/advisory_circulars/</a> ", as below:  "You can find copies of ACs on the FAA website at <a href="http://www.faa.gov/regulations_policies/advisory_circulars/">http://www.faa.gov/regulations_policies/advisory_circulars/</a> ; or <a href="http://www.airweb.faa.gov/rgl">www.airweb.faa.gov/rgl</a> ."		<b>Not Accepted.</b> The previous revision (chg 1) incorporated the the AIR-500 comments and no changes were made to this paragraph from the previous revision.
#	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)	Disposition/Response to Comment

<b>Comments Submitted By:</b>		Catherine M Graham						
<b>Organization:</b>		AFS-470						
<b>Phone:</b>		202-267-3327						
	AC 20-138D ch2	ii and 30	j and 5-2.3d	"service availability prediction tool (SAPt) for RAIM..." and "However SAPt does not..."	"suggest capitalizing all letters in SAPT acronym per website, " <a href="http://www.sapt.faa.gov">www.sapt.faa.gov</a> ", Service Availability Prediction Tool (SAPT)	Service Availability Prediction Tool (SAPT)	F	<b>Accepted.</b>
	AC 20-138D ch2	ii and 30	k and 5-2.3j	"SAPt does not provide..."	"suggest capitalizing all letters in SAPT acronym per website, " <a href="http://www.sapt.faa.gov">www.sapt.faa.gov</a> ", Service Availability Prediction Tool (SAPT)	"SAPT does not provide..."	F	<b>Accepted.</b>
	AC 20-138D ch2	ii and 76 and 85	n and Paragraph 10-2.2.a(3)(a) and 10-3.2.b(2)	"The FAA's SAPt prediction..."	"suggest capitalizing all letters in SAPT acronym per website, " <a href="http://www.sapt.faa.gov">www.sapt.faa.gov</a> ", Service Availability Prediction Tool (SAPT)	"SAPT prediction program..."	F	<b>Accepted.</b>

[For detailed instructions on how to fill out the columns below, please see the Instructions sheet.](#)

Comments Submitted By:		Transport Airplane Directorate (POC:Jeff Meyers)					
Organization:		ANM-111					
Phone:		425-227-1275					
AC 20-138D ch2	32	5-3.2 b.	"With GPS/SBAS equipment it is also acceptable to flight plan an alternate using an RNAV approach to LNAV minimums at the alternate airport rather than a ground-based approach aid (see paragraph 15-7.1)."	Could you please say "GPS-based" instead of an "RNAV" approach? The navigation specification is "RNP APCH" referring to "RNAV" may cause confusion.	With GPS/SBAS equipment it is also acceptable to flight plan an alternate using an RNAV <b>GPS-based</b> approach to LNAV minimums at the alternate airport rather than a ground-based approach aid (see paragraph 15-7.1).	E	<b>Partially Accepted.</b> To be absolutely clear, "RNAV" was replaced with "RNAV(GPS)" since this is the name of the approach with an LNAV minima.
AC 20-138D ch2	iv and 98	v and 12-8. d.	During an LNAV/VNAV approach, or When using any advisory vertical guidance during an LNAV or LP approach, or when using GPS substitution on a conventional approach procedure, the flight crew must ensure compliance with a step-down fix altitude restriction using the primary The <b>current</b> RNAV(GPS) procedure design criteria attempts to place <b>final approach segment</b> step-down fixes on or below the VNAV path to provide an opportunity for a continuous descent final approach to the landing runway. <b>But the same isn't true for conventional procedures which have different design criteria. However, For any approach other than LNAV/VNAV or LPV</b> there is no guarantee the VNAV path guidance will always clear <b>the final approach segment</b> step-down fix altitude restriction(s). Therefore, airworthiness applicants must include language for a limitation in the AFM(S)/RFM(S) (or equivalent documentation) requiring the flight crew to use the primary barometric altimeter to comply with a step-down fix altitude restriction during an LNAV, LNAV/VNAV, or LP approach. Equipment manufacturers should also include a limitation in the equipment operating instructions or flight crew operating manual."	Checked in with AFS-420, actually the design criteria for RNAV (GPS) and conventional approaches is not different in this area. Standard design puts the stepdown fix at or below the vertical path. The issue discussed at the ACF is the "indication" of the aircraft's altitude due to differences in temperature. The issue for this part of the AC is that the manufacturer does not need to display a stepdown fix on an LPV or LNAV/VNAV (or ILS). Additionally, since the paragraph now includes GPS substitution, the language for a limitation in the AFM(S)/RFM(S) should not be limited to LNAV or LP because pilots must comply on step-downs on a LOC or VOR flown with advisory VNAV. (Though operationally most pilots may not use substitution on final approach there is a provision with stipulations for pilots that have OpSpec C300 and follow the C300 guidance.) Please see suggested language to cover these cases.	Suggest: "d. When using any advisory vertical guidance during an <b>approach to LNAV or LP minimums, or when using GPS substitution on a conventional approach procedure</b> , the flight crew must use the primary barometric altimeter to ensure compliance with any altitude restrictions. RNAV(GPS) procedure design criteria <b>puts final approach segment</b> step-down fixes on or below the VNAV path to provide an opportunity for a continuous descent final approach to the landing runway. There is no guarantee the VNAV path guidance will always clear the <b>final approach segment</b> step-down fix altitude restriction(s). Therefore, airworthiness applicants must include language for a limitation in the AFM(S)/RFM(S) (or equivalent documentation) requiring the flight crew to use the primary barometric altimeter to comply with a <b>final approach segment</b> step down fix altitude restriction during an <b>approach when using advisory vertical guidance</b> . Equipment manufacturers should also include a limitation in the equipment operating instructions or flight crew operating manual..."		<b>Partially Accepted.</b> The main point is not just temperature errors for baro-VNAV but also there are no equipment standards for generating "advisory" vertical guidance. That is, advisory vertical guidance can be done by any means and therefore can't be trusted to the same degree as as vertical guidance for credit (LNAV/VNAV, LPV or ILS). The paragraph is changed as follows: "... <i>RNAV(GPS) procedure design criteria puts final approach segment step-down fixes on or below the VNAV path to provide an opportunity for a continuous descent final approach to the landing runway. However, for any approach other than LNAV/VNAV, LPV, or ILS there is no guarantee the VNAV path guidance will always clear the final approach segment step-down fix altitude restriction(s).</i> "

[For detailed instructions on how to fill out the columns below, please see the Instructions sheet.](#)

<b>Comments Submitted By:</b>		Transport Airplane Directorate (POC:Jeff Meyers)						
<b>Organization:</b>		ANM-111						
<b>Phone:</b>		425-227-1275						
								Therefore, airworthiness applicants must include language for a limitation in the AFM(S)/RFM(S) (or equivalent documentation) requiring the flight crew to use the primary barometric altimeter to comply with a final approach segment step-down fix altitude restriction during an LNAV, LP, or non-ILS conventional approach. "
AC 20-138D ch2	118	15-6.c.	"The Aeronautical Information Manual provides some operational flexibility regarding the flight planning operational mitigation for equipment that has FDE capability. Refer to paragraphs 1-1-19g and 1-2-3d in the Aeronautical Information Manual for specific operational guidance."	AIM references are updated	1-1-17 b.5. and 1-2-3 d	E	<b>Accepted.</b>	
AC 20-138D ch2	118	15-7.1 a.	"Refer to paragraphs 1-1-20 c.7(a) and 5-4-5 k.7(h) in the Aeronautical Information Manual for specific operational guidance."	AIM references are updated	1-1-18c.9. and 5-4-5 m.7. (h)	E	<b>Accepted.</b>	
AC 20-138D ch2	A5-6	4	"In the U.S., refer to sections 1-1-19, 1-1-20, 1-2-3 and 5-4-5 in the Aeronautical Information Manual for specific operational guidance."	AIM references are updated	1-1-17,1-1-18, 1-2-3 and 5-4-5		<b>Accepted.</b>	

[For detailed instructions on how to fill out the columns below, please see the Instructions sheet.](#)

<b>Comments Submitted By:</b>		Transport Airplane Directorate (POC:Jeff Meyers)					
<b>Organization:</b>		ANM-111					
<b>Phone:</b>		425-227-1275					
AC 20-138D ch2	A9-2	m	Ground-Based Augmentation System (GBAS) "... In the U.S., this is referred to as local area augmentation system (LAAS). International GBAS standards are defined in ICAO Annex 10."	In an effort to harmonize globally, the United States has migrated towards referring to the system as GBAS. Reference: Aeronautical Information Manual (6/25/15) 5-4-5 m. "GLS" is the acronym for GBAS Landing System. The U.S. version of GBAS has traditionally been referred to as LAAS. The worldwide community has adopted GBAS as the official term for this type of navigation system. To coincide with international terminology, the FAA is also adopting the term GBAS to be consistent with the international community.	Suggest striking sentence: <del>In the U.S., this is referred to as local area augmentation system (LAAS).</del>	E	<b>Accepted.</b>
AC 20-138D ch2	A9-2	o.	Local Area Augmentation System (LAAS). LAAS is the U.S. implementation of GPS/GBAS.	In an effort to harmonize globally, the United States has migrated towards referring to the system as GBAS. Reference: Aeronautical Information Manual (6/25/15) 5-4-5 m. "GLS" is the acronym for GBAS Landing System. The U.S. version of GBAS has traditionally been referred to as LAAS. The worldwide community has adopted GBAS as the official term for this type of navigation system. To coincide with international terminology, the FAA is also adopting the term GBAS to be consistent with the international community.	Suggest striking this definition or change to say that LAAS is the legacy term for US implementation.		<b>Accepted.</b> Used the 'legacy term' suggestion.

[For detailed instructions on how to fill out the columns below, please see the Instructions sheet.](#)

Comments Submitted By:			Transport Airplane Directorate (POC:Jeff Meyers)					
Organization:			ANM-111					
Phone:			425-227-1275					
	AC 20-138D ch2	A 9-5	LAAS	Local Area Augmentation System	In an effort to harmonize globally, the United States has migrated towards referring to the system as GBAS. Reference: Aeronautical Information Manual (6/25/15) 5-4-5 m. "GLS" is the acronym for GBAS Landing System. The U.S. version of GBAS has traditionally been referred to as LAAS. The worldwide community has adopted GBAS as the official term for this type of navigation system. To coincide with international terminology, the FAA is also adopting the term GBAS to be consistent with the international community.	Suggest striking this term unless you keep it and refer to it as the legacy term for US implementation.		<b>Not Accepted.</b> We have to keep the acronym definition because we kept the acronym in the "legacy definition" and the RTCA/DO-246D ICD listed in appendix 10 still uses the LAAS acronym.
#	Document Name	Page Number	Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)	Disposition/Response to Comment
Comments Submitted By:			J. Brady					
Organization:			ACE-111					
Phone:			816-329-4132					
	AC 20-138D Chg 2	16	3-4.b(2)	"...2-dimensional RNP navigation computer functions..."	Not sure if navigation <b>computer</b> functions denote anything specific.	Recommend to remove computer "...2-dimensional RNP navigation functions..."	Editorial	<b>Accepted.</b>
	AC 20-138D Chg 2	96	12-8.a	"...waypoints that make up the IAP..."	First use of "IAP", should be spelled out	Recommend to spell out IAP acronym.	Editorial	<b>Accepted.</b> Spelled out 'instrument approach procedure', but there is no need to use an acronym since this is the only place it is used.

[For detailed instructions on how to fill out the columns below, please see the Instructions sheet.](#)

<b>Comments Submitted By:</b>		Transport Airplane Directorate (POC:Jeff Meyers)						
<b>Organization:</b>		ANM-111						
<b>Phone:</b>		425-227-1275						
	AC 20-138D Chg 2	133	17-2.b	2nd sentence - "Regardless of the method(s) used, sufficient assessment should take place to ensure that any resulting FTE information or values are valid for the navigation conditions or procedures to which they are to be applied."	The sentence provides no guidance, only unnecessary ambiguity.	Remove the sentence.	Editorial	<b>Accepted.</b>
	AC 20-138D Chg 2	133	17-2.b	3rd sentence - "The assessment should key to types of procedures to be flown, appropriately consider normal, non-normal and rare normal operations, should address pilot capability or system variability to the extent necessary, and should have sufficient repeatability to have confidence in the FTE level(s) that result."	Readability.	The FTE assessment should consider the following factors - (i) types of procedures (ii) operations being normal or not (e.g., normal, non-normal, rare normal, etc) (iii) pilot capability (iv) system variability.  17-2.c The FTE assessment should produce consistent FTE level(s) repeatedly.	Editorial	<b>Partially Accepted.</b> Changed paragraph 17-2.b to read: " <i>FTE values may be established by analysis (e.g., of existing data), by simulation (e.g., in a suitable flight training simulator), through flight verification (e.g., data collected from flight demonstration(s) with an appropriately configured aircraft), or any combination of these methods. The FTE assessment should produce repeatable, consistent FTE level(s) and should key to:</i> • <i>Types of procedures to be flown,</i> • <i>Operations being normal or not (i.e., normal, non-normal, rare normal, etc.),</i> • <i>Pilot capability, and</i> • <i>System variability</i>